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Crisis Management in Argentina during the 1994–95 Mexican Crisis

How Did Markets React?

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The Mexican crisis of 1994–95 had strong spillover effects on other countries. This study of how capital markets reacted to each policy announcement and piece of breaking news during the crisis reveals that the market welcomed announcements that reflected Argentina's adoption of credible policies and firm commitment to the currency board.

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Summary findings

Argentina was hit hard by the Mexican crisis of 1994–95. The Argentine peso came under attack and there was a run on bank deposits. Argentina successfully announced a series of policies to mitigate the spillover effects, without abandoning its currency board.

Ganapolsky and Schmukler show how capital markets reacted to each policy announcement and piece of breaking news.

They find that Argentina's agreement with the International Monetary Fund, the dollarization of reserve deposits in the central bank, and the reduction in reserve requirements, among other things, had a strong positive impact on market returns. The market welcomed announcements that reflected the adoption of credible policies and demonstrated a firm commitment to the currency board.

The authors also find that, after a period of higher volatility, the appointment of a new finance minister (after Domingo Cavallo left the finance ministry) calmed down stock and bond markets, significantly decreasing the variance in stock and bond market returns. On the other hand, the interest rate became more volatile after the appointment of the new finance minister and when reserve requirements were lowered.

This paper — a product of Macroeconomics and Growth, Development Research Group — is part of a larger effort in the group to understand how financial markets work. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Emily Khine, room MC3-347, telephone 202-473-7471, fax 202-522-3518, Internet address kkhine@worldbank.org. Sergio Schmukler may be contacted at sschmukler@worldbank.org. July 1998. (34 pages)

Comments Welcome

The Impact of Policy Announcements and News on Capital Markets: Crisis Management in Argentina during the Tequila Effect

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I. Introduction

The crises initiated in Mexico (1994) and in Thailand (1997) had strong spillover effects on other countries. The Mexican crisis affected, among others, Argentina and Brazil, as well as Malaysia, the Philippines, and Thailand. The forced flotation of the Thai baht prompted devaluations in Indonesia, Malaysia, the Philippines, and South Korea, while it provoked direct or indirect turbulence in both developed and emerging markets around the world.[1]

The global extent of recent crises and the potential damaging consequences of being affected by contagion continuously attract attention among economists and policymakers. Most of the research concentrates on understanding the causes and consequences of financial crises. In this paper, we focus on another aspect of financial crises. We study how crisis management might change the dynamics of contagion effects. Once a country has been affected by the spillover effects of an external crisis, which are the policies that help resolve a crisis? On the other hand, which are the announcements and news that negatively impact capital markets?[2]

In the previous two crises, several approaches have been tried to avert the spillover effects. For instance, in the case of the Mexican crisis, Argentina's former finance minister wanted to change the markets' expectations by showing a strong commitment to defend the exchange rate peg. On March 11, 1995, *The Economist* reported:

> *"Mr. Cavallo has said that he would rather 'dollarize' the economy entirely than devalue the peso."*

While Argentina tried to reinforce the free convertibility of its currency during the Mexican crisis, Malaysia attempted to insulate its financial markets from speculative pressure during the Asia crisis. While accusing foreign speculators for orchestrating Malaysia's economic crisis, Malaysian Prime Minister Mahathir Mohamad said:

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[1] Countries with both fixed and flexible exchange rates have seen their currencies under pressure. Countries with good fundamentals have also experienced turbulence in their financial markets.

[2] "Announcements" are policy measures undertaken by the government, like signing an agreement with the International Monetary Fund. "News" events are meaningful economic or political episodes--like a presidential election or the appointment of a new finance minister.

"Currency trading is unnecessary unproductive and totally immoral. It should be made illegal." New York Times, September 21, 1997.

While Asian economies are still searching for a way to recover from the crisis and to prevent potential contagion effects, we are able to draw some lessons from the Mexican crisis. In this paper we analyze the experience of Argentina during the spillover of the Mexican crisis, dubbed the "tequila effect."

Argentina presents an excellent case study of crisis management due to various reasons. First, Argentina was arguably the most affected country by the Mexican peso devaluation on December 20, 1994, besides Mexico itself. Even though Argentine fundamentals were very different from Mexico's, Argentina's peg to the dollar and overall financial stability were reexamined during the tequila effect. On December 28, the central bank sold $353 millions of reserves (the largest amount since the currency board was established). In the three months following the Mexican peso devaluation, the central bank sold more than one third of its foreign exchange reserves. Argentina's stock market index plummeted 50 percent between December 19, 1994 and March 8, 1995. Argentine bond prices fell 36 percent and the peso interest rate jumped from 10.8 percent to 19.33 percent during the same period. By March 11th, 1995, there was great uncertainty on Argentina's fortune. *The Economist* reported:

"The big question to the [Latin American] region is whether recession will force the Argentines to ... devalue."

Second, Argentina is a unique case study since it is under a currency board system, which constrains its monetary policy. At least 80 percent of the monetary base had to be backed by United States-dollar reserves or other internationally liquid assets (not issued by the Argentine government).[3] The rest of the monetary base could be backed by dollar-denominated bonds issued by the Argentine government. Therefore, Argentina's policymakers needed to use alternative instruments to revert the negative external shock.

Third, Argentina's policymakers took an active role in preventing a financial crash and a devaluation of the peso. Finally, Argentina was successful in controlling the

[3] In 1995 more than 80 percent of the monetary base was backed by international assets. The Convertibility Law allows international reserves to be at least two thirds of the monetary base, after the central bank's first Board of Directors change.

negative transmission. After the Asian crisis erupted, Argentina's expertise in dealing with crises had already been internationally acknowledged. By September 23, 1997, the press reported:

> *"Argentines have an excellent experience in crises management ... Thailand should talk to them" Whilliam Rhodes, Vice-president of Citibank, La Nacion (newspaper),*
>
> *"It was kind of strange to come from Latin America [to Asia] and try to give some advice, because for years it was the reverse" Miguel Kiguel, Argentina's Finance Undersecretary, Dow Jones International.*

In this paper we estimate how different policy announcements and news impacted Argentina's stock market index, Brady bond prices, and peso-deposit interest rates. Among the announcements and news received by the markets we can find the following. The central bank lowered reserve requirements--on U.S.-dollar deposits and on peso deposits--to assist troubled institutions and to reactivate the economy. Peso deposits in the central bank were automatically converted into U.S. dollars to give reassurance to the currency board. Rediscounts were limited. The central bank charter was reformed to gain more flexibility to act as a lender of last resort. An agreement with the International Monetary Fund (IMF) was reached. A fiduciary fund for bank capitalization was issued to support weak institutions, and a deposit insurance was established. Finally, President Menem was reelected and the finance minister was replaced.

The remainder of the paper is organized as follows. Section II looks at how capital markets are integrated. We estimate to what extent a change in external markets seems to impact the Argentine markets. Section III describes in detail the announcements and news received by the markets. Section IV studies how each announcement and news impacted the short-run and long-run returns of financial variables. Section V focuses on how announcements and news impacted the markets' volatility. Section VI summarizes the results and concludes.

II. Integration of Capital Markets and Spillover Effects

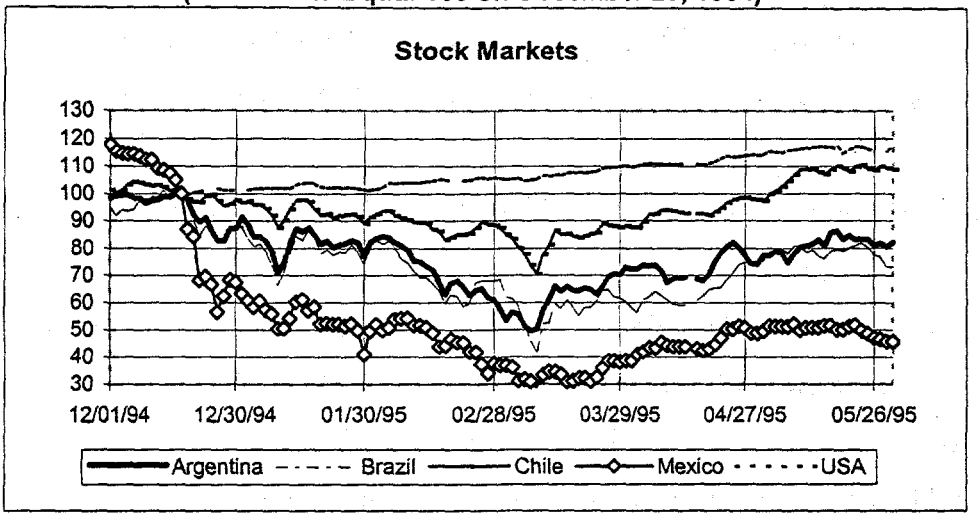
This section shows that Latin American capital markets have become increasingly integrated. Asset prices from different countries tend to co-move. Therefore, an external shock (such as the Mexican crisis) is more prone to affect other countries than in previous years.

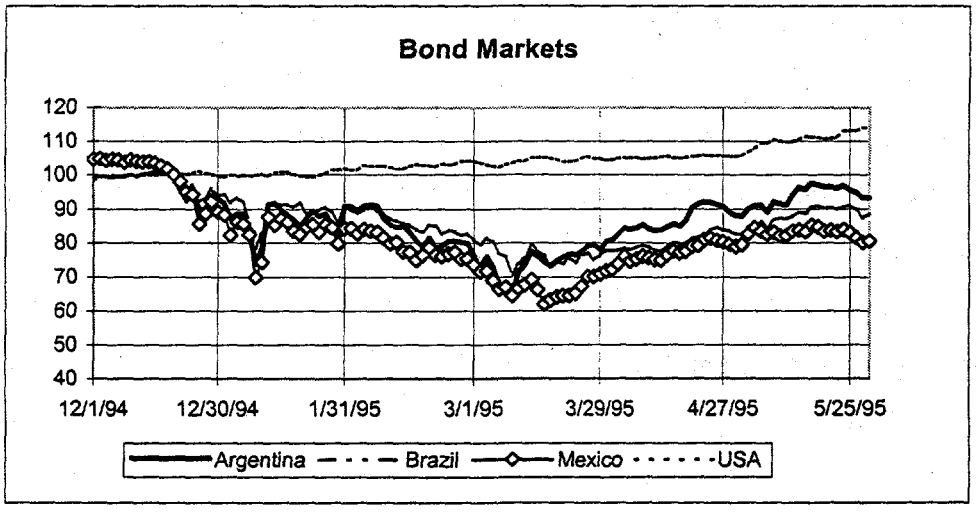
The wider participation of international investors in emerging markets has helped to link these markets with developed markets and among each other. This participation has been facilitated by new financial instruments--including American depository receipts (ADRs), country funds, and world equity benchmark shares (WEBS)--which provide access to assets from different countries.

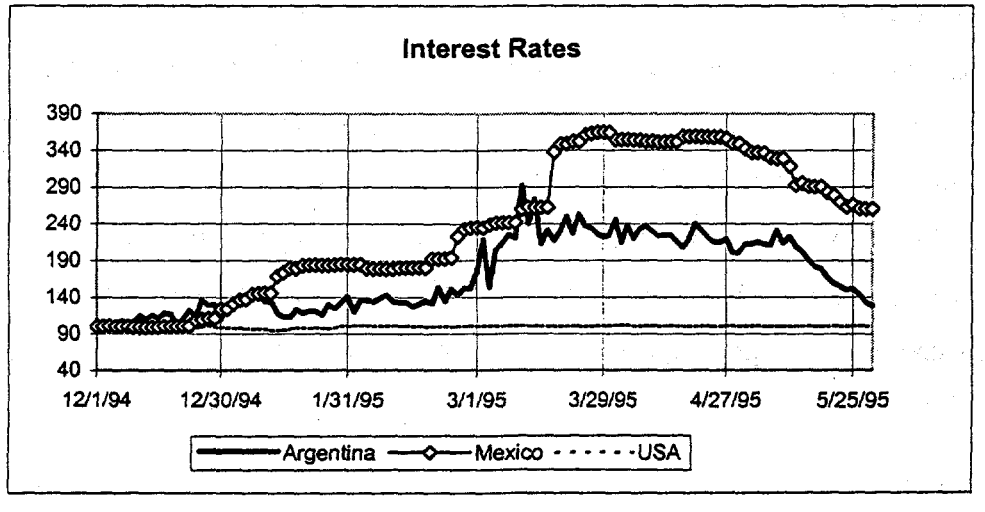
It is likely that the participation of international investors has increased the co-movement among emerging financial markets, particularly during crises. Different aspects of their participation might be explaining the higher co-movement. First, if mutual fund managers need to keep a balanced portfolio across emerging markets, they might be induced to buy and sell assets of different countries simultaneously. Second, if small international investors--who buy the new financial instruments--face a cost to acquire information about each particular country, they would be less likely to distinguish across emerging markets. Then, they would tend to sell Argentine assets when Mexican asset prices fall, just as a precautionary measure. Lastly, knowing that international capital might be fickle, domestic investors would discount foreign investors' reaction and would act consequently.

In this paper we examine the integration of Argentina's capital markets with other capital markets in Latin America, namely Brazil, Chile, and Mexico. We also include the U.S. as a benchmark to compare how the co-movement among Latin American markets differs from the one with the world biggest financial market. Figure 1 plots the reaction of capital markets around the Mexican crisis. The charts illustrate that the Latin American markets moved jointly, suggesting the presence of spillover effects.

Figure 1
Evolution of International Capital Markets During the Mexican Crisis
(All Markets Equal 100 on December 20, 1994)







Several papers analyze the issue of co-movement. For instance, Calvo and Reinhart (1995) work with weekly returns on equities and Brady bonds for Asian and Latin American emerging markets, concluding that there is some evidence of the Mexican crisis spreading to other Latin American countries. Valdés (1996) uses secondary market debt prices and country credit ratings to show contagion in Latin America. He demonstrates that fundamentals are unable to explain cross-country co-movement of creditworthiness. Eichengreen, Rose, and Wyplosz (1996) show that the probability of a speculative attack increases when there is a crisis somewhere else in the world. They also suggest that trade was the dominant channel of transmission of the crisis. From another perspective, Frankel and Schmukler (1997) analyze how the crisis was transmitted to other countries using data on country funds. On the other hand, using data on total return on individual stocks, Wolf (1997) fails to find strong evidence of contagion after controlling for sectoral composition.

Following the methodology used in the literature, we first compute correlation matrices for changes in daily stock market indexes, Brady bond prices, and interest rates. We calculate correlation matrices as a way to analyze the degree of cross-country co-movement. We do not control for fundamentals since we are primarily interested in observing to what extent markets are linked. We are not trying to determine what explains the spillover of shocks. We obtain correlation matrices for the pre-Mexican crisis period (January 1992-December 1994), the crisis period (December 1994-June 1995), and the post-crisis period (July 1995-July 1997) to look at changes in co-movement at different points in time.[4]

Our results from the stock and bond market correlation matrices--displayed in Table 1--show some interesting facts. First, Latin American markets have higher correlations among themselves than their correlations with the U.S. Second, Argentina, Brazil, and Mexico appear to be more linked in the post-crisis subperiod than in the pre-crisis one. For example, the bond price correlation between Brazil and Argentina goes from 41 to 69 percent, while the one between Brazil and Mexico rises from 31 to 64

[4] We also compute correlations for the entire sample period. They lie between the low and high values found in the subperiod correlations.

Table 1
Correlation Matrices of Stock Prices, Bond Prices and Interest Rates in Different Sub-periods

Stock Prices (Daily changes)

January 2nd, 1992 - December 19th, 1994
First differences of logs
N. of Obs. 741

	ARG	BRA	CHI	MEX	USA
ARG	1				
BRA	0.19	1			
CHI	0.19	0.15	1		
MEX	0.13	0.14	0.14	1	
USA	0.14	0.09	0.15	0.24	1

LR Test 159.70 ***
Degrees of freedom 10

December 20th, 1994 - June 30th, 1995
First differences of logs
N. of Obs. 133

	ARG	BRA	CHI	MEX	USA
ARG	1				
BRA	0.70	1			
CHI	0.66	0.78	1		
MEX	0.47	0.38	0.32	1	
USA	0.23	0.27	0.28	0.22	1

LR Test 270.51 ***
Degrees of freedom 10

July 3rd, 1995 - July 10th, 1997
First differences of logs
N. of Obs. 629

	ARG	BRA	CHI	MEX	USA
ARG	1				
BRA	0.45	1			
CHI	0.19	0.16	1		
MEX	0.42	0.29	0.18	1	
USA	0.21	0.14	0.04	0.21	1

LR Test 278.99 ***
Degrees of freedom 10

Bond Prices (Daily changes)

January 2nd, 1992 - December 19th, 1994
First differences of logs
N. of Obs. 367

	ARG	BRA	MEX	USA
ARG	1			
BRA	0.41	1		
MEX	0.65	0.31	1	
USA	0.39	0.20	0.31	1

LR Test 334.40 ***
Degrees of freedom 6

December 20th, 1994 - June 30th, 1995
First differences of logs
N. of Obs. 133

	ARG	BRA	MEX	USA
ARG	1			
BRA	0.81	1		
MEX	0.81	0.76	1	
USA	0.12	0.10	0.04	1

LR Test 300.16 ***
Degrees of freedom 6

July 3rd, 1995 - July 10th, 1997
First differences of logs
N. of Obs. 507

	ARG	BRA	MEX	USA
ARG	1			
BRA	0.69	1		
MEX	0.64	0.64	1	
USA	0.28	0.22	0.17	1

LR Test 678.71 ***
Degrees of freedom 6

Interest Rates (Daily changes)

January 2nd, 1992 - December 19th, 1994
First differences of logs
N. of Obs. 527

	ARG	MEX	USA
ARG	1		
MEX	0.03	1	
USA	-0.08	-0.07	1

LR Test 2.65
Degrees of freedom 3

December 20th, 1994 - June 30th, 1995
First differences of logs
N. of Obs. 129

	ARG	MEX	USA
ARG	1		
MEX	-0.03	1	
USA	0.11	0.08	1

LR Test 1.11
Degrees of freedom 3

July 3rd, 1995 - July 10th, 1997
First differences of logs
N. of Obs. 485

	ARG	MEX	USA
ARG	1		
MEX	-0.06	1	
USA	-0.01	0.00	1

LR Test 0.81
Degrees of freedom 3

percent. Analogous evidence is found for the stock market indexes in Argentina, Brazil, and Mexico. The correlations with Chile and with the U.S. do not display clear changes across these two subperiods.

A third conclusion from these results is that during the crisis period the correlation coefficients rise substantially. For instance, the correlations among the Argentine, Brazilian, and Mexican bond prices rise to near 80 percent. While the correlations among the Argentine, Brazilian, Chilean, and Mexican stock markets increase significantly with respect to the pre-crisis period. For example, the correlation between Chile and Brazil jumps from 15 percent to 78 percent. On the other hand, the correlations with the U.S. bond market become lower, whereas no clear pattern arises from the stock market.

The correlations for the stock market indexes and for the bond prices in all subperiods are statistically significant (except for some of the correlations with the U.S.). The likelihood ratio tests reject the null hypothesis that the correlation matrices are diagonal. Under the null hypotheses of no correlation, the likelihood ratio test -Nlog|R| is distributed as a χ^2 with 0.5p(p-1) degrees of freedom (where |R| is the determinant of the correlation matrix, and p is the number of series under analysis).[5] These results imply that joint correlations within stock and bond markets are statistically different from zero. On the other hand, the correlations among Argentine, Mexican, and U.S. interest rates appear neither individually or jointly significant. This might be the result of different monetary policies followed in each country.

As an alternative technique, we use factor analysis to study the link among stock prices, debt prices, and interest rates across countries. This technique helps us to determine how to group the series. We calculate the eigenvalues of the correlation matrices to decide how many factors account for the variance in the series. Table 2 shows that the first two factors explain at least around 90 percent of the total variance of the series. The eigenvalues of the second factors are not greater than 1. Depending on what proportion of the variance the second factor explains, we decide to retain one or two

[5] See Pindyck and Rotemberg (1990).

factors. In general, two factors explain above 90 percent of the variance, while the first factor captures around 70 or 80 percent of the variance.[6]

Next, we look at factor loadings, which stand for the correlation between the variables and the factors. We want to study which factors have high and low loadings for each variable. In order to interpret factor loadings more easily we perform a varimax rotation.[7] The pattern that results from the rotation is quite interesting. In the case of stock market indexes, Brazil, Chile, Mexico, and the U.S. have one factor in common, whereas Argentina is explained by a different factor during the pre-crisis period. These results change when we analyze the other subperiods. During the crisis, all Latin American market indexes are explained by one factor, while the Dow Jones is explained by another factor. In the post-crisis period, Chile seems to be explained by a different factor, but the second eigenvalue is very low. One factor may be well explaining all stock markets--what is supported by the fact that all countries have a positive significant weight in both factor loadings.

When looking at the bond market, Latin American bond prices are explained by one factor in all subperiods, while the U.S. Treasury bill is explained by a different factor. With respect to interest rates, the correlation between the factors and the variables suggests the presence of two groups: Argentina and Mexico on one side, and the U.S. on the other. In the post-crisis period, the U.S. interest rate also seems to have a significant weight in the factor that explains Argentina and Mexico.

Our correlation and factor analysis results indicate that Latin American markets tend to move together and are influenced by a different factor than the U.S. market, particularly during a crisis period. This might be the combination of different circumstances. Latin American countries might share common fundamentals, so their capital markets move together. Investors might perceive these countries as being similar (even though they are not), and react accordingly. Institutional factors (like the way fund

[6] The eigenvalues of the other factors are significantly less than one. Since they explain a very small fraction of the variance, we decided to work with at most 2 factors.

[7] The varimax rotation maximizes the variance of factor loadings across variables for each factor. Its goal is to display a clearer pattern of loadings, factors that are clearly marked by high loadings for some variables and low loadings for others.

Table 2

Factor Analysis of Stock Prices, Bond Prices, and Interest Rates

	Before the Crisis *1/1/1992-12/19/94*		**During the Crisis** *12/20/1994-6/30/95*		**After the Crisis** *7/3/1995-7/10/97*	
	Factor 1	Factor 2	Factor 1	Factor 2	Factor 1	Factor 2
Stock Prices						
Eigenvalues						
Absolute Value:	3.53	1.01	4.17	0.68	4.50	0.37
Percentaje of the total variance explained:	71%	20%	83%	14%	90%	7%
Normalized Factor Loadings After Varimax Rotation:						
Argentina	0.06	**-1.00**	**0.93**	-0.34	**0.86**	0.48
Brazil	**0.87**	-0.06	**0.93**	-0.30	**0.79**	0.58
Chile	**0.98**	-0.05	**0.97**	-0.16	0.39	**0.92**
Mexico	**0.94**	-0.02	**0.90**	-0.38	**0.91**	0.38
USA	**0.94**	0.04	-0.26	**0.96**	**0.91**	0.38
Bond Prices						
Eigenvalues						
Absolute Value:	2.81	0.92	3.42	0.50	3.17	0.78
Percentaje of the total variance explained:	70%	23%	86%	13%	79%	20%
Normalized Factor Loadings After Varimax Rotation:						
Argentina	**-0.92**	-0.31	**0.96**	-0.24	**0.98**	-0.15
Brazil	**-0.82**	-0.41	**0.84**	-0.50	**0.97**	-0.22
Mexico	**-0.97**	0.05	**0.89**	-0.43	**0.96**	-0.27
USA	-0.13	**-0.98**	-0.32	**0.94**	-0.20	**-0.98**
Interest Rates						
Eigenvalues						
Absolute Value:	1.68	1.00	2.31	0.60	2.41	0.41
Percentaje of the total variance explained:	56%	33%	77%	20%	80%	14%
Normalized Factor Loadings After Varimax Rotation:						
Argentina	**0.87**	0.28	**-0.94**	-0.28	**0.94**	0.59
Mexico	**0.92**	-0.11	**-0.94**	-0.27	**0.88**	0.29
USA	-0.05	**-0.99**	-0.26	**-0.96**	0.86	**0.94**

managers trade and the participation of international investors) might be connecting Latin American capital markets.

Our results might also be a consequence of the location where each market trades. The assets that trade in the same market seem to have a higher co-movement, aside from their origin. Brady bonds were always traded in the U.S. secondary markets, and they show high co-movement across Latin America regardless of the subperiods we consider. Their correlations are always higher than the stock market correlations. On the other hand, the U.S. Treasury bill appears as an alternative to the Latin American bonds, particularly during and after the crisis. When looking at the stock market indexes we find that Argentina is explained by the same factor that explains the other countries after 1994. This is consistent with the fact that Argentina has become more integrated with the international capital markets over time, for example, by trading ADRs in New York.[8]

To conclude, both the correlation matrices and the factor analysis show that capital markets are interconnected. This explains why the shock in Mexico triggered a similar reaction in Latin American capital markets including Argentina. Similar fundamentals or contagion might be explaining this co-movement. Figure 1 shows how bond prices, stock prices, and interest rates moved together during the Mexican crisis of December 1994. Given that the spillover made Argentine markets fall, the rest of the paper investigates which announcement helped in the recovery.

III. Announcements and News

Mexican policymakers decided to widen the exchange rate band on December 20, 1994. By December 22, the Mexican peso was allowed to float due to intense pressure in the foreign exchange market. In the period December 19-27, the Argentine stock market fell around 17 percent, Argentine bond prices fell 12 percent, and the Argentine peso-deposit interest rate rose 1 percentage point. In order to modify this trend, starting on December

[8] We believe that more research is necessary to understand the pattern of capital markets integration, however, this topic is beyond the goal of this paper.

28, Argentine policymakers began to send signals to the markets. A description of all the policy announcements and news the markets received follows.[9]

1) Reserve requirements on U.S. dollar deposits were relaxed - December 28, 1994: After the devaluation of the Mexican peso, holders of the Argentine peso revised their expectations about the sustainability of the exchange rate peg. Therefore, they increased their holdings of U.S. dollars. In order to provide liquidity to the banks, reserve requirements on U.S. dollar deposits were lowered retroactively.[10]

2) Reserve requirements on peso deposits were reduced - January 12, 1994: A few days after the devaluation of the Mexican peso, concerns about future defaults lead depositors to withdraw their money from private banks to exchange their pesos for dollars. In order to alleviate the pressure from banks, reserve requirements on peso deposits were lowered retroactively to the same level on foreign currency deposits. Banks were also allowed to maintain their required reserves in either currency.

The following charts illustrate how dollar and peso reserve requirements were modified following the Mexican peso devaluation.

	Reserve Requirements (Percent)					
	Argentine Pesos			U.S. Dollars		
Period	Checking Account	Savings Account	Time Deposit	Checking Account	Savings Account	Time Deposit
8/93-12/15/94	43	43	3	43	43	3
12/16/94-12/31/94	43	43	3	35	35	1
01/01/95-01/15/95	35	35	1	35	35	1
01/16/95-01/31/95	30	30	1	30	30	1
02/01/95-02/28/95	32	32	1	32	32	1
03/01/95-07/31/95	33	33	2	33	33	2

[9] A detailed description of the news can be found in the Argentine central bank and finance ministry regulations (Comunicaciones "A" 2293, 2307, 2315, 2317, 2338, 2350, 2298, 2308, Decreto 290/95, 286/95, and 445/95, Ley 24.485) as well as in the newspapers Ambito Financiero and El Cronista Comercial.

[10] The retroactive lowering of reserve requirements was a mean to alleviate the banks' financial iliquidity. Reserve requirements are calculated as a 30-day average, then retroactive lower reserve requirements helped banks to substantially decrease the cash they needed to deposit in the central bank.

3) Bank deposits in the central bank were dollarized - January 12, 1995: In order to give additional support to the currency board, the central bank decided to dollarize the financial institutions' peso deposits held by the central bank. The purpose of the dollarization was to give confidence to the markets by decreasing the central bank incentives to reduce its peso-denominated debt, through a devaluation of the peso.

4) A public safety net was established - January 12, 1995: The central bank constituted a fund to help institutions, by purchasing their non-performing loans. All banks gave 2 percent of their deposits to establish the 700 million fund (administered by Banco Nacion). The fund provided a safety net to the system. By mid 1997, the non-performing loans were paid back to Banco Nacion, and the shareholders (the banking sector) recovered their initial capital.

5) The use of rediscounts was limited - February 3, 1995: Before the convertibility plan, rediscounts were frequently used to alleviate iliquidity problems faced by financial institutions. However, they could have been channeled to speculation during financial stress. Moreover, rediscounts could have been used to take advantage of the differential between the rediscounts rate and the interbank rates. This differential usually increases during crises. To avoid an undesired use of rediscounts, the central bank established some limits on how financial institutions could take advantage of them. Banks were forbidden to use rediscounts to buy back their debt, they were only allowed to use rediscounts to return deposits.

6) Modification of the central bank charter - February 27, 1995: The central bank acquired more flexibility to assist troubled financial institutions. First, the time limit for financial assistance was extended from 30 days to 120 days. Second, financial assistance could exceed the net worth of financial institutions. Finally, the central bank could decide how to use the assets acquired from troubled institutions.

7) Relaxation of reserve requirements - March 10, 1995: As another instrument to lower reserve requirements, the Argentine central bank allowed private banks to use 50 percent of their cash as reserve requirements. Through this mechanism, minimum reserve requirements did not need to be modified, but actual reserve requirements changed. After

May 31 1995, this 50 percent returned gradually to 0. An increase in this measure implies lower reserve requirements.

8) Announcement of an agreement with the IMF (to be signed four days later) - March 10, 1995: The Argentine government signed an agreement with the IMF. Under this agreement Argentina accepted to be monitored by the IMF. At the same time, the Argentine government gained access to international credit for roughly 7 billion dollars.

9) Creation of a fiduciary fund for bank capitalization - March 28, 1995: A fund was established to help troubled financial institutions, by giving them additional credit. The fund was also meant to restructure the fragile financial system, by purchasing non-performing loans (which were going to be sold later). The fund was established by issuing a bond, with the help of 500 million dollars committed by the World Bank. Bondholders, the finance ministry, and the central bank managed the fund.[11]

10) Establishment of deposit insurance - April 4, 1995: In order to give confidence to the financial sector, a deposit insurance system was established. The insurance is administered by a private institution (SEDESA). The central bank, the finance minister, and commercial banks participate in SEDESA's board. The financial institutions absorb the cost of the fund. Each bank pays between 0.03 and 0.06 percent of its deposits, according to its risks. The insurance covers up to 10,000 dollars for each person who holds money in a checking account, savings account, and/or time deposits up to 90 days. Furthermore, the insurance covers up to an additional 10,000 dollars per person for deposits of at least 90 days. The deposit insurance does not cover deposits that receive an interest rate of 2 percentage points higher than the interest rate published by the central bank. Any deposits that receive extra incentives beyond the interest rate are also exempted from the insurance.

11) President Menem was reelected - May 15, 1995: Even though the economy was in a deep recession, President Menem was reelected. His political campaign was based on the need to maintain price stability and to continue with the economic reforms.

12) Finance minister Domingo Cavallo was replaced by central bank president Roque Fernandez - July 26, 1997: After several weeks of political turmoil between the

finance minister and other political sectors, President Menem decided to change his finance minister. He appointed central bank president Roque Fernandez as the new finance minister.

IV. Short-Run and Long-Run Impact of Announcements and News

This section studies the impact of the announcements and news (described above) on the rates of growth of Argentina's financial variables. Several papers look at the effect of announcements and news on capital markets. Some of these papers use the event study methodology to measure the impact of announcements--like earning announcements--on equity prices. This methodology investigates whether returns are abnormally high across firms after certain announcements. A description of the event study methodology can be found in Campbell, Lo, and MacKinlay (1997).

Another set of papers focuses on the effect of macroeconomic announcements on capital markets. These papers study how the release of information is transmitted to the markets and what types of news impact the markets. For example, Hardouvelis (1988) finds that exchange rates and interest rates respond primarily to monetary news. Harvey and Huang (1991) study foreign exchange markets and attribute the increased volatility to macroeconomic news announcements. Elmendorf, Hirschfeld, and Weil (1992) show, from another perspective, that major historic news affect bond price movements, but explain only a small fraction of those movements. Berry and Howe (1994) find a significant relationship between public information and trading volume on the New York Stock Exchange. Mitchell and Mulherin (1994) find that the number of announcements by Dow Jones and the stock market activity are directly related--even though the relationship is weak (as found in other studies). Jones, Lamont, and Lumsdaine (1996) find that conditional volatility and excess returns on daily bond prices are higher on

[11] Acknowledging the extent of the crisis, the World Bank approved in record time its participation in the fiduciary fund.

(predetermined) announcement days. This might be due to trading or to the information-gathering process. Similar results are found by Ederington and Lee (1993).

In this paper we cannot follow the methodology used in previous papers. There are not enough experiences to evaluate the same type of announcements in several occasions. However, we are able to investigate which role announcements and news played in modifying the negative dynamics triggered by the Mexican peso devaluation. In order to do so, we model the behavior of the stock market index, Brady bond prices, and the interest rate. Then, we look for structural breaks to determine whether the changes in regime coincide with the days the markets received the news. We also perform out-of-sample forecasts to evaluate how markets would have behaved without announcements. Finally, we introduce two dummy variables per announcement or news to quantify their effect on each market.

IV.a. Modeling Argentina's Financial Variables

Separate models are estimated for each variable, controlling for the behavior of domestic and foreign variables. The regressors include variables believed to explain each market, namely, past changes of the endogenous variable, past changes of other Argentine financial variables, and changes in other countries' financial variables. (The latter reflect changes in the international financial environment.)[12]

Unit root tests indicate that almost all variables are non-stationary. Augmented Dickey-Fuller tests reject the hypothesis of non-stationarity for the financial sector reserves and the call interest rate. Given that the domestic variables might be linked to the external variables by a stationary linear long-run relationship, we have also tested for cointegration, following Johansen (1991). We failed to find cointegration, so we decided to work with models in first differences. The variables found to be *I(0)*, integrated of order zero, are included in levels.[13]

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[12] As part of the foreign variables we constructed a stock market index and a bond index, which include Brazil, Chile, and Mexico (the three countries we believe Argentina is most connected to). The indexes have been weighted by the relative sizes of each country.

The type of models that we work with is:

$$\Delta Y_t^{Argentina} = \alpha + \sum_{l=1}^{L_1} \gamma_{1l} \Delta Y_{t-l}^{Argentina} + \sum_{f=1}^{F_1} \sum_{j=1}^{L_2} \gamma_{2j} \Delta Y_{f,t-j}^{External} + \sum_{f=1}^{F_2} \sum_{j=1}^{L_3} \kappa_{fj} \Delta X_{f,t-j} + \varepsilon_t.$$

$Y_t^{Argentina}$ stands for the endogenous Argentine financial variable: the stock market index, Brady bond prices, and a peso-deposit interest rate. $Y_t^{External}$ stands for the foreign variable: the Mexican exchange rate and Brady bond prices, an index of Latin American bond prices, and the U.S. T-bill bond price. Note that all the variables in the regressions are logarithms.

Each model has F exogenous variables X_f. These are variables for which there is daily data. We also believe that these variables are exogenous (when lagged) and are relevant to explain the endogenous variable. Foreign variables are contemporaneous, because they are believed to be exogenously determined. Domestic variables are lagged, although we have also estimated the contemporaneous relationship using two-stage least squares. We follow the general-to-specific methodology to determine the number of lags. We first include several lags and then exclude most of the insignificant ones. The estimations are reported in Section IV.c, where the dummy variables are included.

IV.b. In Search of Structural Breaks

After determining the correct model for each variable, we evaluate the stability of the coefficients during the crisis. The goal of this exercise is to investigate whether the announcements and news released during the crisis helped reduce the external spillovers.

In order to search for structural breaks in the coefficients we compute recursive least squares. This methodology estimates an initial model and re-estimates the model repeatedly, using larger subsamples in every repetition. In each estimate a one-step ahead forecast is computed. The residuals are scaled such that the variance is constant.

The residuals of the different models are plotted in Figure 2 for the period December 19, 1994 to mid 1995. Most of the residuals lie within the (+/- 2 standard deviation) confidence interval, except during the period of announcements. In fact, during

[13] The failure to find cointegration is consistent with the plots of the Argentine and the other Latin American

the days of major announcements the residuals fall outside the bands. For instance, after it was announced that deposits were being dollarized, the residuals suggest that the stock and bond markets rose while the interest rate decreased. When news about the imminent agreement with the IMF became public, our estimates yield a positive reaction of the stock and bond markets, and an increase of the interest rate. The results from the recursive least squares are consistent with Table 3, which displays the percent change in each financial variable on the announcement days.[14]

As another way to shed some light on how news affected the markets we perform out-of-sample forecasts. In order to compute the forecasts, we estimate each of the models up to the day before any announcements were made (December 27, 1994). Then we calculate out-of-sample forecasts for the following 6-month period. The purpose of these forecasts is to show how the variables appear to would have behaved if the markets had not received any announcements or news (namely, if the government had remained inactive after the crisis).

The out-of-sample forecasts are plotted in Figure 3. The figure displays the actual and forecasted values of the stock market index, Brady bonds, and interest rate. The plots show that the actual values outperform the forecasted ones. In other words, once the crisis was initiated the capital markets would have performed much worse if the government had not taken an active role. The stock market and the bond markets would have not recovered as they did, and the interest rate would have remained higher.

Figure 3 also shows that the forecasted values of the Argentine bond prices and interest rates resemble the performance of the Mexican bond prices and interest rates. For instance, in the absence of announcements the bond prices would have partially recovered (probably pushed by the other Latin American bond prices). On the other hand, the forecasted values of the stock market prices are much lower than the Argentine and Mexican actual values after March 1995. This suggests that the dynamics generated

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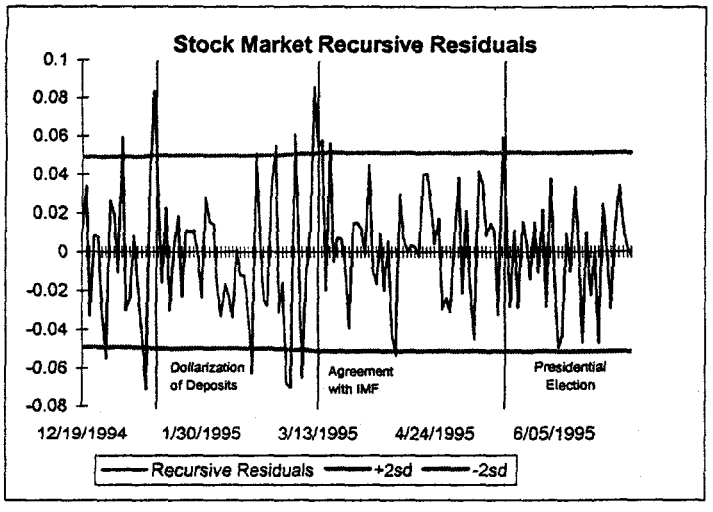
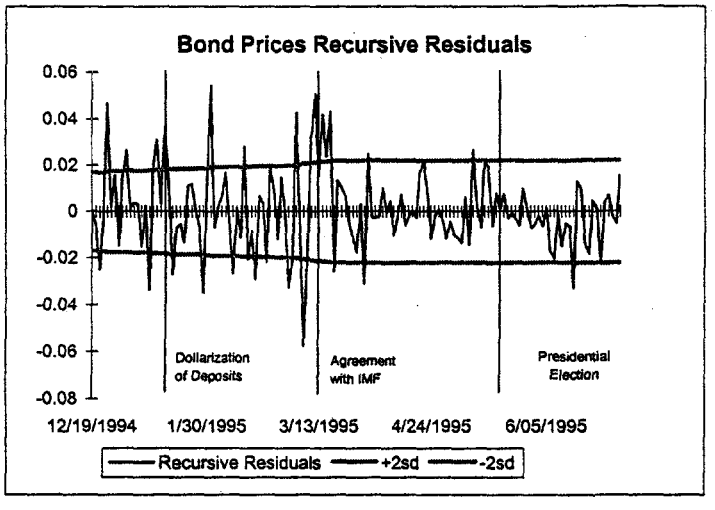
variables, where we can observe divergence after the Mexican crisis.

[14] During March 1 and 2 the residuals for the stock and bond models fall below the lower band, whereas the residuals for the interest rate models lie above the upper band. On March 3, the reverse happens. This last example shows that not all changes in the residuals can be clearly identified with particular announcements. During those days, the debate about the future of the convertibility plan intensified in the media.

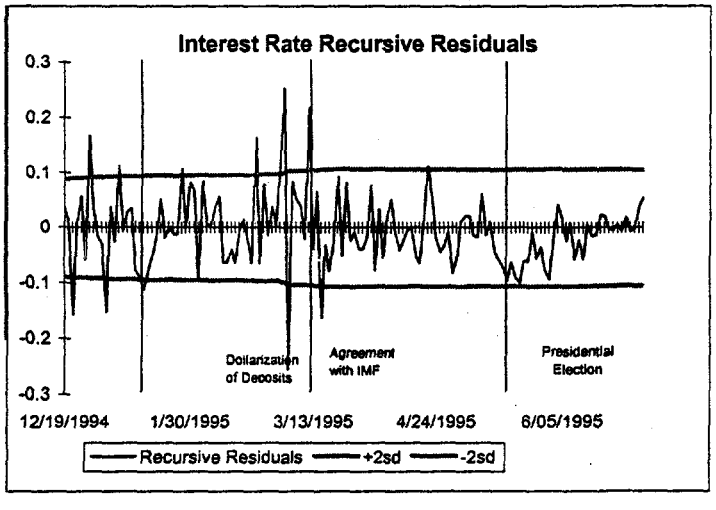
Figure 2
Recursive OLS Residuals



Days showing instability:
December: 27
January: 2, 10, 12
February: 16, 17, 24
March: 1, 2, 3, 10, 13, 14, 16
April: 10
May: 17



Days showing instability:
December: 21, 23, 27, 30
January: 10, 11, 13, 17, 27, 31
February: 8, 13, 16
March: 1, 2, 3, 7, 8, 9, 10, 14, 16, 17, 29, 30
April: 20
May: 9



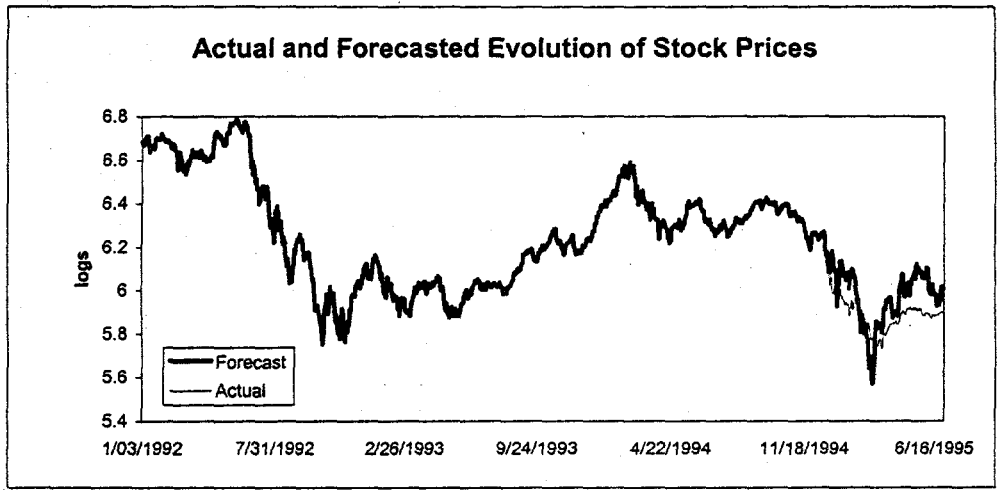
Days showing instability:
December: 21, 27
January: 2, 5, 13, 26
February: 1, 21
March: 1, 2, 3, 10, 15
April: 20

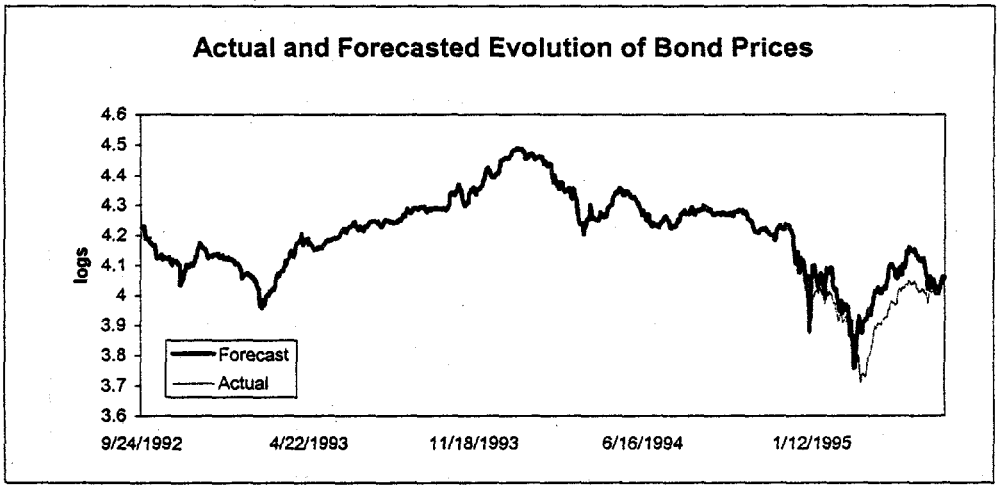
Table 3

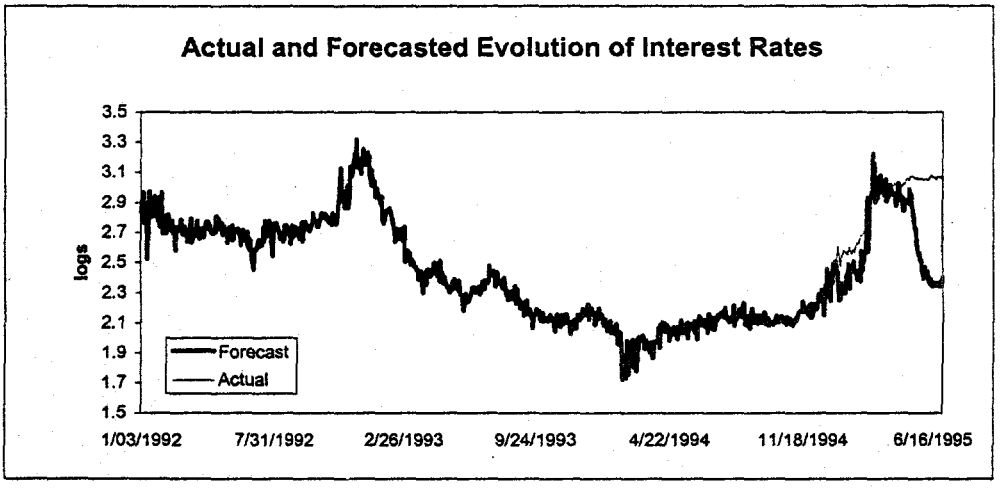
Reaction of Capital Markets on Days of Announcements and News
Percentage Change in Prices

Announcement and News	Bonds	Stocks	Int. Rate
12/28/94 - Reserve requirements in dollars were relaxed	0.00%	-0.15%	5.97%
01/12/95 - Bank deposits in the central bank were dollarized	15.94%	10.40%	0.52%
01/31/95 - Reserve requirements were increased	10.65%	7.07%	5.69%
02/03/95 - Rediscounts were limited	1.49%	-0.80%	-0.34%
02/27/95 - Modification of the central bank charter	-0.47%	-5.24%	6.69%
02/28/95 - Reserve requirements were increased	-0.47%	-1.26%	-0.61%
03/10/95 - Announcement of an agreement with the IMF	9.30%	12.83%	32.82%
03/28/95 - Creation of a fiduciary fund	0.48%	1.53%	-3.63%
04/12/95 - Establishment of a deposit insurance scheme	0.23%	0.77%	0.52%
05/15/95 - President Menem was reelected	2.43%	1.81%	-3.39%
Average 12/20/94 to 05/12/95	*2.44%*	*3.21%*	*7.29%*
07/26/96 - Finance minister was replaced	-0.57%	-4.10%	-1.63%
Average 04/25/96 to 07/25/96	*0.62%*	*1.07%*	*2.11%*

Figure 3
Out-of-Sample Forecast: 12/27/94 - 6/30/95
(The Forecast Exclude the Effects of All the Announcements and News)







between December 1994 and March 1995 would have caused the Argentine stock prices to fall even further. The recovery of stock market prices after mid March suggests that the announcements substantially changed the behavior of stock market prices. However, the difference between actual and forecasted values might also be explained by other factors not captured by the models.

To sum up, Figure 2 and Table 3 insinuate that the dollarization of deposits and the agreement with the IMF, among other announcement, had a positive impact on the capital markets. Figure 3 suggests that the announcements jointly had a very positive effect on the capital markets.[15] In the rest of the paper we measure the short-run and long-run effects of each policy announcement and news on the markets.

IV.c. Measuring the Impact of Each Announcement and News

In order to measure the short-run and long-run effects on capital markets, we construct two dummy variables for each announcement and news. We have read all the Argentine newspapers to determine the days in which announcements and news became public. The dummy variables take the values zero or one. The short-run dummy variables are defined as follows: $D^{sr}_{k,a}=1$ and $D^{sr}_{k,a+1}=1$, where a is the day the announcement was released, while k defines the announcement. The short run includes both the day of and the day after the announcement, to account for the moment the news appeared in the printed press and because some announcements were made after the markets closed. The long-run dummy variables are defined as $D^{lr}_{k,t}=1$ for all $t \geq a$. Note that our specifications calculate the impact on the rates of growth, thus a short-term effect implies a long-term shift on the level of the variables.

Some exceptions are made in the definition of the dummy variables. The variable *deposit guarantee* is equal to 1 during the period March 19 to April 13. At that time, the press was reporting both about the creation of a fiduciary fund and about the establishment of deposit insurance. It would be difficult to disentangle the two effects, so

[15] It is also very likely that the announcements have--directly or indirectly--affected the real side of the economy.

we include both of them in the *deposit guarantee* variable.[16] In the case of reserve requirements, we use the actual requirement level instead of a dummy variable. We include two quantitative (rather than qualitative) variables to reflect how the reserve requirements policy changed over time.

The models we estimate are the following:

$$\Delta Y_t^{Argentina} = \alpha + \Phi' D_t + \sum_{l=1}^{L_1} \gamma_{1l} \Delta Y_{t-l}^{Argentina} + \sum_{f=1}^{F_1} \sum_{j=1}^{L_2} \gamma_{2j} \Delta Y_{f,t-j}^{External} + \sum_{f=1}^{F_2} \sum_{j=1}^{L_3} \kappa_{fj} \Delta X_{f,t-j} + \varepsilon_t.$$

As mentioned before, $Y_t^{Argentina}$ stands for the endogenous Argentine financial variable, while $Y_t^{External}$ stands for the foreign variable.

In all the regressions, our interest focuses on the estimates of Φ. These estimates are the coefficient of D_{kt}^{sr} and D_{kt}^{lr}, which stand for the short-run and long-run effect of announcements and news, and for the impact of different reserve requirement levels. When ϕ_k is statistically different from zero, we interpret the corresponding announcement and news to have a significant impact in explaining the dependent variable.

Table 4 displays the ordinary least squares (OLS) estimates, using robust estimates of the standard errors.[17] The models include lagged values of the endogenous variable, as well as contemporaneous and lagged values of the foreign variables. The lags that repeatedly appeared to be statistically insignificant across specifications have been excluded. Robust results for each variable can be summarized as follows.

a) <u>*Stock Market Index*</u>: Three dummy variables appear statistically significant and with positive sign across multiple specifications. The agreement with the IMF is statistically significant both in the short run and in the long run. The size of the coefficients is also large relative to the other variables. The short-run effect of the agreement has an estimated impact of around 7 percent. The dollarization of deposits is the third variable that always appears significant in the short-run behavior of the stock

[16] On January 12, February 27, and March 10 there were several announcements. However, the dollarization of deposits, the reform of the central bank charter, and the agreement with the IMF were the ones that received all the attention from the press, economists, and policymakers. That is why we assign any change in those days to the mentioned variables.

[17] Starting dates vary, see Appendix for details.

market index. On the other hand, the variables rediscount policy and the reform of the central bank charter have negative effects on stock market prices.

Among the other exogenous variables, we find that the Mexican stock market index is highly correlated with the Argentine stock market index. The Mexican exchange rate also seems to affect the Argentine stock market index. A devaluation in Mexico has a negative effect on the Argentine stocks. U.S. bond prices are significant and positively correlated with the stock market index.

b) *Brady Bonds prices*: The three dummy variables that are statistically significant and positive in the stock market equation have the same effect on bond prices. In other words, the agreement with the IMF has a positive short-run and long-run impact on the bond prices' growth rate, and the dollarization of deposits has a positive short-run effect.

Other announcements and news also turn out to be significant in different bond equations. Lowering reserve requirements positively affects bond prices. The finance ministry had predicted that lower reserves would have a stimulating effect on the economy--the bond market appears to have immediately reacted to that prediction. The deposit guarantee and the fiduciary fund for bank capitalization appear to have had a negative effect on bond prices, although this effect disappears under some specifications. The rediscount policy positively affects bond prices in the short run. Lastly, the presidential election seems to have a mild positive short-run effect on bond prices under a number of specifications. The change of finance minister has a negative short-term effect on bond prices.

Among the exogenous variables, we find that the Mexican Brady bond prices are positively correlated with the Argentine ones. U.S. bond prices and liquid reserves of the financial system are also significantly related to the change in bond prices.

c) *Interest Rate*: Some announcements and news appear consistently significant across the interest rate regressions. Among them, reserve requirements are statistically significant. The estimations show that the greater the cash banks are able to use, the lower the interest rate. The dollarization of deposits also seems to lower the peso interest

Table 4

The Impact of Announcements and News on Capital Markets: OLS Estimates – Robust Standard Errors

All Variables are First Differences except the Ones Marked with (#) and the Announcement Variables

Dependent Variable:	Stock Market Index			Dependent Variable:	Bond Prices			Dependent Variable:	Interest Rates		
	Coefficient	t-statistic			Coefficient	t-statistic			Coefficient	t-statistic	
Constant	0.003	0.291		Constant	0.008	1.748	***	Constant	-0.071	-2.579	*
ARG.STOCKS (-1)	0.021	0.650		ARG.BONDS (-1)	-0.023	-0.799		ARG.BONDS (-1)	-0.342	-2.079	**
ARG.STOCKS (-2)	-0.100	-2.633	*	ARG.BONDS (-2)	-0.077	-1.141		ARG.BONDS (-2)	-0.374	-2.386	**
MEX.STOCKS	0.326	6.874	*	ARG.BONDS (-3)	-0.106	-3.011	*	ARG.BONDS (-3)	-0.201	-1.284	
MEX.STOCKS (-1)	0.125	2.921	*	ARG.RESERVES FIN.SYSTEM (-1)	-0.011	-2.324	**	ARG.BONDS (-4)	-0.238	-1.980	**
MEX.EXCHANGE RATE	-0.149	-3.146	*	MEX.BONDS	0.776	19.216	*	ARG.DEPOSITS (-1)	-0.507	-1.707	***
MEX.EXCHANGE RATE (-1)	-0.095	-2.357	**	MEX.BONDS (-1)	0.095	1.976	**	ARG.DEPOSITS (-2)	-0.038	-0.115	
MEX.EXCHANGE RATE (-2)	-0.114	-2.763	*	MEX.BONDS (-2)	0.067	1.029		ARG.INTEREST RATE (-1)	-0.693	-9.650	*
USA BONDS	0.258	1.870	***	MEX.BONDS (-3)	0.135	2.711	*	ARG.INTEREST RATE (-2)	-0.362	-5.811	*
				MEX.BONDS (-4)	-0.017	-0.593		ARG.INTEREST RATE (-3)	-0.143	-2.719	*
				MEX.BONDS (-5)	0.068	2.144	**	ARG.INTEREST RATE (-4)	-0.051	-1.157	
				USA BONDS	0.193	3.148	*	ARG.CALL RATE (-1) #	0.020	1.446	
				USA BONDS (-1)	0.066	2.610	*	ARG.CALL RATE (-2) #	0.012	0.688	
								ARG.CALL RATE (-3) #	0.022	1.155	
								ARG.CALL RATE (-4) #	-0.025	-1.859	***
								LATIN AM.BONDS	0.128	0.883	
								LATIN AM.BONDS (-1)	0.124	0.722	
								LATIN AM.BONDS (-2)	0.284	1.555	
								LATIN AM.BONDS (-3)	-0.229	-1.319	
								LATIN AM.BONDS (-4)	0.259	1.897	***
RESERVE REQUIREMENTS	-0.000	-0.377		RESERVE REQUIREMENTS	-0.000	-1.759	***	RESERVE REQUIREMENTS	0.001	0.775	
CASH IN BANKS	0.000	0.041		CASH IN BANKS	0.000	0.593		CASH IN BANKS	-0.001	-2.094	**
DOLLARIZATION	0.003	0.657		DOLLARIZATION	-0.003	-0.543		DOLLARIZATION	0.008	0.494	
DOLLARIZATION ST	0.045	7.758	*	DOLLARIZATION ST	0.023	3.384	*	DOLLARIZATION ST	-0.118	-6.791	*
REDISCOUNTS	-0.013	-1.399		REDISCOUNTS	-0.003	-0.505		REDISCOUNTS	-0.011	-0.557	
REDISCOUNTS ST	-0.015	-1.932	***	REDISCOUNTS ST	0.011	2.522	**	REDISCOUNTS ST	0.029	1.675	***
CENTRAL BANK CHARTER	-0.004	-0.345		CENTRAL BANK CHARTER	-0.003	-0.414		CENTRAL BANK CHARTER	0.038	1.267	
CENTRAL BANK CHARTER	-0.030	-3.589	*	CENTRAL BANK CHARTER ST	-0.010	-1.429		CENTRAL BANK CHARTER	0.039	1.254	
AGREEMENT IMF	0.030	2.824	*	AGREEMENT IMF	0.022	2.252	**	AGREEMENT IMF	-0.039	-0.981	
AGREEMENT IMF ST	0.067	7.541	*	AGREEMENT IMF ST	0.020	2.159	**	AGREEMENT IMF ST	0.115	2.302	**
DEPOSITS GUARANTEE	-0.011	-1.359		DEPOSITS GUARANTEE	-0.018	-2.298	**	DEPOSITS GUARANTEE	0.032	1.865	***
DEPOSITS GUARANTEE ST	-0.008	-1.293		DEPOSITS GUARANTEE ST	-0.003	-0.717		DEPOSITS GUARANTEE ST	0.006	0.568	
PRESIDENT RE-ELECTION	-0.006	-1.006		PRESIDENT RE-ELECTION	-0.002	-0.602		PRESIDENT RE-ELECTION	-0.014	-1.065	
PRESIDENT RE-ELECTION	-0.011	-1.547		PRESIDENT RE-ELECTION ST	0.010	2.625	*	PRESIDENT RE-ELECTION	-0.053	-4.212	*
FINANCE MINISTER	0.001	0.458		FINANCE MINISTER CHANGE	0.001	1.130		FINANCE MINISTER	-0.002	-0.768	
FINANCE MINISTER	-0.011	-1.066		FINANCE MINISTER CHANGE ST	-0.004	-3.050	*	FINANCE MINISTER	-0.016	-2.495	**
Adjusted R-squared		0.149		Adjusted R-squared		0.566		Adjusted R-squared		0.351	
SE of regression		0.022		SE of regression		0.009		SE of regression		0.039	
Log likelihood		3482		Log likelihood		4058		Log likelihood		1904	
F-statistic		11.50		F-statistic		58.45		F-statistic		17.01	

ST: Short Term. *, (**), [***]: Significant at the 1, (5), [10] percent confidence level.

rate in the short run. On the other hand, the agreement with the IMF raises the interest rate in the short run--as if the markets perceived that the agreement implied a tighter monetary policy. However, the long-run effect is negative (although it is only significant in some specifications). Two other variables are sometimes significant. The reform of the central bank charter and the deposit insurance variable seem to raise the interest rate, while the presidential election is negatively correlated with the interest rate in the short run.

We also control for the overnight interest rate, total deposits, and bond prices, which turn to have the right sign and are mostly significant. As a foreign variable we control for the index of Latin American bonds.

The reported results are robust to various specifications. They mostly agree with previous results found in Ganapolsky (1996). We have estimated the above models using different lag structures. We have also estimated the contemporaneous relationship among the Argentine financial variables using two-stage least squares. Moreover, we have estimated the models as seemingly unrelated regressions (SUR), since there is potential cross-correlation among the equations. Finally, as part of the sensitivity analysis, we have computed another set of models. In these estimations we calculate the long-run relationship between the endogenous variable and each exogenous variable. The dummy variables that are significant in the reported models remain mostly significant across the other specification. The only difference arises in the instrumental variable regressions, because we failed to find good instruments.

V. The Impact of Announcements and News on Volatility

In the previous sections we have analyzed the impact of news on the first moments of the variables. However, the residuals from the previous models show some clustering in volatility. There are periods where volatility is low and periods where volatility is high (particularly in the aftermath of the Mexican devaluation). These residuals suggest that the variance is not constant over time. Therefore we estimate the behavior of the variance

using generalized autoregressive conditional heteroscedasticity (GARCH) models--frequently applied in finance. Jones, Lamont, and Lumsdaine (1996) use a similar approach to study the effect of news on the bond market volatility.

The models we estimate have the following specifications:

$$\Delta Y_t^{Argentina} = \alpha + \Phi' D_t + \sum_{l=1}^{L_1} \gamma_{1l} \Delta Y_{t-l}^{Argentina} + \sum_{f=1}^{F_1} \sum_{j=1}^{L_2} \gamma_{2j} \Delta Y_{f,t-j}^{External} + \sum_{f=1}^{F_2} \sum_{j=1}^{L_3} \kappa_{fj} \Delta X_{f,t-j} + \varepsilon_t,$$

$$\varepsilon_t \sim N(0, \sigma_t^2)$$

$$\sigma_t^2 = \omega + \Psi' D_t + \sum_{k=1}^{L} \tau_{1k} \varepsilon_{t-k}^2 + \sum_{j=1}^{L} \tau_{2j} \sigma_{t-j}^2.$$

In each model the variance at t depends on four elements: a constant term ω, exogenous factors given by the news variables D_t, past variances σ_{t-j}^2, and past shocks to volatility given by ε_{t-k}^2.

GARCH models have one main advantage over the models used previously. These models enable us to test whether the announcements and news have an impact on volatility. In other words, we can now estimate if financial variables become more or less stable after the markets receive new information. Also, by explicitly specifying the variance of ε_t, GARCH models yield efficient estimates of the parameters α, Φ, γ, and κ.

In a world of risk averse investors, we expect that when volatility decreases (increases) after some news, the present value of the assets should react positively (negatively) the day of the announcement. However, markets do not always anticipate what happens to future volatility. Then, GARCH models allow us to see--even for the cases where the markets do not discount the future change in volatility--if markets become more tranquil or more agitated after the announcements.

We have computed GARCH estimates assuming and not assuming normally distributed errors. The quasi-maximum likelihood estimations--which compute consistent covariances (following Bollerslev and Wooldridge, 1992)--are displayed in Tables 5. The specifications GARCH (1,1) and GARCH (2,2) seem to capture the variability in the variance; no further lags appear significant. We exclude all variables that repeatedly turned out to be non-significant in the estimations, since the large number of parameters

Table 5

The Impact of Announcements and News on Capital Markets: GARCH Estimates – Robust Standard Errors

All Variables are First Differences except the Ones Marked with (#) and the Announcement Variables

Dependent Variable:	Stock Market Index			Dependent Variable:	Bond Prices			Dependent Variable:	Interest Rates		
	Coefficient	t-statistic			Coefficient	t-statistic			Coefficient	t-statistic	
Constant	0.001	1.824	***	Constant	0.004	2.052	**	Constant	-0.058	-6.173	*
ARG.STOCKS (-1)	0.045	1.701	***	ARG.BONDS (-1)	0.030	1.037		ARG.BONDS (-1)	-0.064	-0.571	
ARG.STOCKS (-2)	-0.085	-3.043	*	ARG.BONDS (-2)	0.009	0.307		ARG.BONDS (-2)	-0.186	-1.824	***
MEX.STOCKS	0.367	10.674	*	ARG.BONDS (-3)	-0.095	-3.521	*	ARG.DEPOSITS (-1)	-0.352	-2.011	**
MEX.STOCKS (-1)	0.129	3.548	*	ARG.RESERVES FIN.SYSTEM (-1) #	-0.005	-1.213		ARG.INTEREST RATE (-1)	-0.645	17.881	*
MEX.EXCHANGE RATE	-0.140	-3.773	*	MEX.BONDS	0.798	24.563	*	ARG.INTEREST RATE (-2)	-0.407	-10.748	*
MEX.EXCHANGE RATE (-1)	-0.078	-1.588		MEX.BONDS (-1)	0.038	0.990		ARG.INTEREST RATE (-3)	-0.185	-5.080	*
MEX.EXCHANGE RATE (-2)	-0.126	-2.608	*	MEX.BONDS (-2)	-0.052	-1.292		ARG.INTEREST RATE (-4)	-0.104	-3.276	*
USA BONDS	0.228	2.582	*	MEX.BONDS (-3)	0.176	4.123	*	ARG.CALL RATE (-1) #	0.031	6.073	*
				USA BONDS	0.165	4.612	*	LATIN AM.BONDS	0.084	0.866	
				USA BONDS (-1)	0.091	3.357	*	LATIN AM.BONDS (-1)	0.075	0.642	
								LATIN AM.BONDS (-2)	0.093	0.766	
								LATIN AM.BONDS (-3)	-0.141	-1.526	
DOLLARIZATION ST	0.043	3.868	*	RESERVE REQUIREMENTS	-0.000	-1.909	**	CASH IN BANKS	-0.000	-2.708	*
REDISCOUNTS ST	-0.033	-5.453	*	DOLLARIZATION ST	0.004	0.287		DOLLARIZATION ST	-0.107	-4.280	*
CENTRAL BANK CHARTER ST	-0.052	-3.404	*	AGREEMENT IMF ST	0.038	2.152	**	PRESIDENT RE-ELECTION ST	-0.058	-2.407	**
AGREEMENT IMF ST	0.077	8.486	*	DEPOSITS GUARANTEE	-0.002	-1.733	**				
Variance Equation				**Variance Equation**				**Variance Equation**			
Constant	0.000	3.050	*	Constant	0.000	2.756	*	Constant	0.001	3.006	*
ARCH(1)	0.109	2.904	*	ARCH(1)	0.010	0564		ARCH(1)	0.133	3.840	*
ARCH(2)	0.136	3.818	*	ARCH(2)	0.181	3.251	*	GARCH(1)	0.782	17.531	*
GARCH(1)	0.027	0.122		GARCH(1)	0.159	1.698	**	RESERVE REQUIREMENTS	-0.000	-2.561	*
GARCH(2)	0.673	3.461	*	GARCH(2)	0.601	6.419	*	CASH IN BANKS	0.000	2.382	**
FINANCE MINISTER CHANGE	-0.000	-2.001	**	FINANCE MINISTER CHANGE	-0.000	-2.123	**	AGREEMENT IMF	-0.000	-3.093	*
Adjusted R-squared		0.142		Adjusted R-squared		0.538		Adjusted R-squared		0.306	
SE of regression		0.022		SE of regression		0.009		SE of regression		0.041	
Log likelihood		3736		Log likelihood		4231		Log likelihood		2119	
F-statistic		14.18		F-statistic		73.05		F-statistic		22.80	

ST: Short Term

*, (**), [***]: Significant at the 1, (5), [10] percent confidence level.

makes the convergence difficult. Therefore, we chose to report only the parsimonious specifications.

GARCH estimation results can be summarized as follows. The volatility of the stock market and bond market behave in a similar way. They are affected by mainly one exogenous variable, the change of minister--which decreases the long-run volatility in the stock and bond markets. In the interest rate equation, more variables appear to be statistically significant. The agreement with the IMF decreases the volatility. The two variables that capture reserve requirements are statistically significant and have the expected sign. A decrease in reserve requirements increases the volatility of the interest rate, although it increases bond prices and it reduces the interest rate.

The GARCH models yield the following results for the announcement variables in the first moment equations. The model for the stock market shows that most of the variables that appeared significant in the OLS estimation remain significant here. In the model for bond prices, the significant announcement variables are: reserve requirements, the agreement with the IMF, and the deposit guarantee and the fiduciary fund. In the interest rate equation, reserve requirements, the dollarization of deposits, and the presidential election remain statistically significant.

VI. Summary of Results and Conclusions

Argentina was hit hard by the Mexican peso devaluation of December 20, 1994. In response to the spillover effects, Argentine policymakers pursued an active policy to revert the crisis by trying to send the right signals to the markets. Monetary policy has been constrained due to the currency board system (under which 80 percent of the monetary base needed to be backed by international reserves during 1995). Nevertheless, Argentina successfully prevented a financial crash without abandoning its peg to the dollar.

This paper analyzed Argentina's crisis management during the tequila effect. We showed that Argentina's capital markets seemed to have performed better than if no

active policies had been taken. We also estimated the impact of each policy announcement and news on the Argentine capital markets. We studied their impact on the short-run and long-run returns and on the markets' volatility. We worked with the stock market index, Brady bond prices, and the interest rate. Our results can be summarized as follows.

The agreement with the IMF seems to be one of the most significant announcement the markets received. Both the stock and bond market returns reacted positively. The short run interest rate increased, while its volatility decreased. These reactions suggest that the markets perceived the agreement as being beneficial in the long run, but with a short-run tightening of domestic credit. We believe that the agreement with the IMF not only implied additional funding for the country, but also signaled to markets that sound policies were going to be adopted. In addition, the agreement gave international support to the way the government was dealing with the crisis. Note that the impact of this announcement is significant even after controlling for changes in foreign markets. Mexico's financial agreement with the IMF and with the U.S. was announced around the same time, which seemed to have positively impacted the entire region.

Among the other announcements, the dollarization of deposits also positively impacted the returns of the stock market and the bond market. At the same time, the dollarization decreased the interest rate. Lower reserve requirements increased bond prices (perhaps because they provided a stimulus to the economy) and reduced the interest rate. However, they seem to have increased the volatility of the interest rate. The fiduciary fund for bank capitalization and the deposit insurance scheme seem to have pushed bond prices downward and to have increased the interest rate. The presidential election appears to have decreased the interest rate and increased the value of Brady bonds. When significant, the reform of the central bank charter appears to have a negative effect on capital markets, increasing the interest rate and reducing the value of stocks and bonds. The effect of the rediscount policy is ambiguous. This variable negatively affects stock prices and interest rates, while it positively affects bond prices.

The change of minister calmed down the stock and bond markets as estimated in the GARCH models. The markets' nervousness about what was going to happen the day

after Mr. Cavallo left the finance ministry appear now to have been unjustified. The stock and bond markets calmed down when the new minister was appointed, but the short-run effect on bond prices is negative. Higher reserve requirements and the agreement with the IMF seem to decrease the volatility of interest rates.

To conclude, the capital markets recovered when they received signals that Argentina's fundamentals were good. There was a differentiation in returns between Argentina and Mexico. The markets welcomed the signals that demonstrated a strong commitment to the existing exchange rate peg and economic program. In this sense, the agreement with the IMF, the dollarization of deposits, and the reelection of President Menem were welcomed by the markets. On the other hand, measures like the reform of the central bank charter, which gave more discretionary power to the central bank, appear to have had a negative effect.

We hope that this case study provides some lessons for future crisis management situations. When enough experiences have accumulated, it would be worthwhile testing whether the impact of each announcement have the same effect across countries. Some Asian countries like Thailand, Indonesia, the Philippines, and South Korea already signed agreements with the IMF (for much larger amounts than 7 billion dollars). However, their capital markets did not react positively to these agreements. It would be useful to learn under which circumstances certain policies have a positive effect. Do these agreements need to be signed simultaneously, like Argentina and Mexico did? Do countries need to show some commitment to confront the crisis besides calling the IMF, like Argentina did? Do policymakers need to signal to markets that they really support the agreements? We believe that these are all interesting topics for future research.

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Appendix: Data Description

The data sources are the Central Bank of Argentina and Bloomberg. The series cover the period January 2, 1992 - July 10, 1997, except when indicated.

We work with the following variables:

1. Stock Markets:

Argentina:	Merval Index
Brazil:	Bovespa Index
Chile:	IPSA Index
Mexico:	IPC Index
USA:	Dow Jones Index
Latin America:	We have constructed a stock market index, including Brazil, Chile, and Mexico. The index is weighted by the relative GDP of each country.

2. Bond Markets:

Argentina:	Discount bond price index
Brazil:	Discount bond price index
Mexico:	Discount bond price index
USA:	US Treasury price index (maturity November 2021)
Latin America:	We have constructed a bond market index, including Brazil, and Mexico. The index is weighted by the relative GDP of each country.

Argentina's bond index starts on September 24, 1992, Brazil's one on June 28, 1993. Mexico's and US's series start on January 2, 1992.

3. Money Markets:

Argentina:	Time deposits in pesos, 30 to 59 days
	Call in pesos, 7 days (interbank market)
Mexico:	Time deposits in pesos, 60 days
USA:	CD in dollars, 1 month

The Mexican data start on September 29, 1992, call interest rate on January 28, 1992, and the others on January 2, 1992.

4. Argentine Financial System:

Fulfillment of reserve requirements (stock) and stock of international reserves held by the Central Bank. Both series end in June 25, 1997.

5. Mexican exchange rate (peso/dollar)

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